

WHAT IS CLAIMED IS:

1. A method of making a nanoporous structure, said method comprising:
 - 5 (a) combining first and second self-assembling molecules under conditions sufficient for said first and second molecules to self-assemble into an ordered composite structure of said first and second molecules, wherein said first molecules include a cross-linking functionality that is lacking in said second molecules;
 - 10 (b) covalently bonding said first molecules via said covalent bonding functionality to produce a stabilized composite structure; and
 - (c) separating said second molecules from said stabilized composite structure to produce said nanoporous structure.
- 15 2. The method according to Claim 1, wherein said nanoporous structure has a uniform porosity.
3. The method according to Claim 2, wherein said two or more nanopores are uniform and regularly positioned in said structure in a regular pattern.
- 20 4. The method according to Claim 1, wherein nanopores of said nanoporous structure have an inner diameter that does not exceed about 5 nm.
5. The method according to Claim 1, wherein said structure is a sheet.
- 25 6. The method according to Claim 1, wherein said structure is a nano-object.
7. The method according to Claim 1, wherein said first and second self-assembling molecules are linear molecules.
- 30 8. The method according to Claim 7, wherein said first and second linear self-assembling molecules have a length of from about 4 to about 50 nm.

9. The method according to Claim 1, wherein said first molecule comprises a single cross-linking functionality.
 10. The method according to Claim 1, wherein said first molecule comprises
5 two different cross-linking functionalities.
 11. The method according to Claim 1, wherein said first and second molecules are organic molecules.
- 10 12. The method according to Claim 1, wherein said separating step (c) comprises immersing said stabilized composite structure in a solvent for said second molecules so said second molecules separate from the remainder of said structure.
- 15 13. A nanoporous structure produced according to the method of Claim 1.
14. The structure according to Claim 13, wherein said structure is a sheet.
15. The structure according to Claim 13, wherein said structure is a nano-object.
- 20 16. An article of manufacture that includes a nanoporous structure according to Claim 12.
- 25 17. A kit for use in producing a nanoporous structure, said kit comprising:
(a) first and second self-assembling molecules that self-assemble upon combination into an ordered composite structure of said first and second molecules, wherein said first molecules include a cross-linking functionality that is lacking in said second molecules; and
30 (b) instructions for use in practicing the method of Claim 1.
18. The kit according to Claim 17, wherein said first and second self-assembling molecules are linear molecules.

19. The kit according to Claim 18, wherein said first and second linear self-assembling molecules have a length of from about 4 to about 50 nm.
20. The kit according to Claim 17, wherein said first and second molecules are
5 organic molecules.